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ART. XXV.—*Mineral Resources of Southern India. No. 7.*
Corundum, Ruby, and Garnet Localities. By LIEUT.
 NEWBOLD, F.R.S., &c., *Madras Army.*

(Read June 4th, 1842.)

Comparative Remarks on the Geognostic Position of the Corundum in Europe and India.—As I am not aware of any detailed account having been published regarding the geognostic position of the corundum in Peninsular India, and since the rocks with which it is associated in the particular locality which I first visited differ from those in which it has been stated to occur in Europe and Southern India, I am induced to preface this paper with the following remarks. Professor Thomson (*Outlines of Mineralogy*, vol. i., p. 213) informs us that "the corundum occurs in imbedded crystals in a rock which consists, according to Count Bournon, of indianite, and contains felspar, fibrolite, several varieties of augite, and also octohedral iron ore; the hair-brown or reddish-brown varieties are called adamantine spar. They occur with fibrolite and octohedral iron ore in a sort of granite containing no quartz." And again (p. 256) he states, that "fibrolite is a mineral found accompanying crystals of corundum in the Carnatic, and that it is a component part of the granite, which is the matrix of the corundum of China." Professor Jameson, in his *geognosy of Peninsular India*, (Ed. Cab. Lib., No. VIII., p. 349-50,) gives a summary of what is known regarding the corundum of Southern India, and states that it occurs embedded in granite and sienite in the district of Salem, in the Madras Presidency, among the mountains of the Carnatic, and in other parts of the Peninsula, associated with cleavelandite, indianite, and fibrolite. Now in the locality I am about to describe, it was found to occur in decomposed beds of a talcose slate, to which gneiss is subordinate, associated with nodules of indurated talc, and of a poor quartzzy iron ore: asbestos, chlorite, actinolite, and schorl were found embedded in the talcose slate.

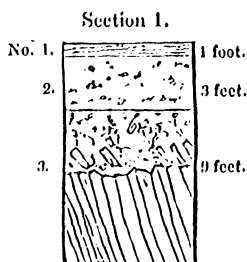
Passing last year through Gram, a village and fort in the Mysore country, about ninety-eight miles westerly from Bangalore, between it and the Western Ghauts, I was informed by the natives of the place that corundum (*Corund ka patthar*¹) was found in this

¹ Corund کرند is the Hindustani term for corundum: can this be indicative of its having first been imported into Europe from India?

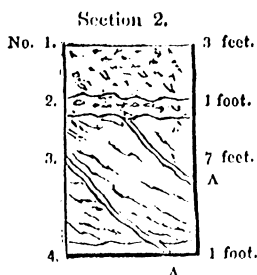
vicinity; at Golhushully, in the division of Noogyhully; at Kulkairi, Burkunhulli, Kundo, and Yedgunkul, in that of Chinrayapatam; at Norhik, in Narsipur; at Deysani Carbonhully, in Banawaram; and at Appianhully, in that of Harnhully. The localities I visited were Golhushully and Kulkairi, at which places the best corundum is said to be obtained. The mines lie about forty-five miles N. by W. from Seringapatam, and about seven or eight E. by N. from the fort of Gram. The formation around Gram is gneiss, associated with protogine. Proceeding from it in a westerly direction, the northern shoulder of the insulated range, south of the village of Belladaira, running nearly north and south, is crossed, and the soil suddenly changes from a light sandy colour to a deep red. The surface of this swell is covered with fragments of a ferro-siliceous schist, with quartz in alternate layers. This mountain-range, as night was coming on, I was not able to examine; but from its singularly-sharp outline, the elevation and shape of its highest peak, and its direction conformable with that of the primary schist, I should say it was, probably, a large ferruginous quartzose bed, in the gneiss associated with quartz iron ore, fragments of which are seen at its base. The natives have a tradition that gold was formerly got from this hill, which is not at all improbable, as it is found in a similar gangue near Baitmungalum, sixty-one and a half miles E. from Bangalore, and at Malliyalum, near the S.W. border of Mysore in Coimbatore. Minute grains occur in the sandy bed of a brook here.

A little farther west, where the talus of the mountain subsides into the plain, the gneiss re-appears, alternating with talc slate in nearly vertical strata. The dip, as observed in an adjoining nala between the mountain and the village of Belladaira, is to the E. by N., and the direction of the strata N. 22° E. The corundum mines of Golhushully lie four or five miles N.E. of this place, and those of Kulkairi about a mile farther. The surrounding country is a succession of smooth slightly convex plains, except to the S.E., where the gneiss rises above the soil in a rocky ridge, terminating in a knoll about 700 yards to the E. by S. of the mines to which it descends, rising again into a slope to W.N.W. of the mines, on which lie fragments of a light brown compact quartz iron ore. Nearly at the bottom of this slope are the mines, from which the ground descends on both sides to the N.W. to a tank, and towards the S.E. to the village of Golhushully, about a mile distant. Between the mines and this village, near the bottom of the ascent on which they

are situated, runs a nala, the bed of which gives a tolerable section of the strata resting on the gneiss.



The first (No. 1.), commencing from the surface is a thin sandy alluvial soil; next (No. 2.) succeeds a dark brown gritty soil, apparently decomposed ferruginous quartz, but sometimes sandy, from two to three feet thick. Below this we see the detritus (No. 3.) of the subjacent gneiss; the quartz veins of which, remaining undecomposed, are observed penetrating into the substance of the soil from below. Some of the veins are broken by the superincumbent weight, aided by their own approach to decomposition. The quartz and felspar veins contain nests of a disintegrating blackish mica. The direction of the beds of gneiss is S. 10° E. with a dip of 60° a little to the N. of E. The surface of the ascent from Golhushully to the mines, except where the blocks of the brown ore above described, and a few edges of talc slate crop out, is covered with the dark brown soil, (No. 1. Section 2,) containing small particles of iron ore, and the broken-up veins of the subjacent rock to the depth of



about three feet: below this lies a bed, (No. 2.) varying from one to two feet in thickness, of chert, angular and rounded fragments of a poor quartzzy iron ore, nodules of a whitish, highly indurated talc, talcose

quartz, and felspar. A variety of schorl occurs imbedded in an indurated brownish talc, generally in three-sided prisms: it fuses into a lighter coloured enamel than the European specimen in my cabinet. This schorl has a shining lustre; fracture uneven; breaks easily across the axis of its prisms; opaque, streak grey, scratches glass and quartz, the latter with difficulty. In this bed the best kinds of corundum are found. Below this is a bed (No. 3.) of greenish earth, evidently of decomposed talcose slate: it is slightly greasy to touch, and falls to pieces with a hissing noise when put into water. Before the blowpipe in the platinum forceps it melts partially into a brownish slag, covered with minute globules of a white enamel, streak slightly coherent, shining, approaching earthy; adheres slightly to the tongue, and emits an argillaceous odour when breathed on. It is traversed by veins (AA) of a compact talc in laminae which in some places bear traces of dislocation. The red earth and a quartz ferruginous paste in small reniform and pisiform nodules, resembling those of haematite, are found intermixed with the more decayed portions of the schist. Beds (No. 4) and veins of white earth are also found in it, occupying the bottom of some of the excavations, as at Kulkairi. These are composed of talc, quartz, and minute particles of the corundum of which the vein is the gangue; streak and fracture earthy; feels gritty, and slightly greasy; adheres slightly to the tongue; does not emit so strong an argillaceous odour as the green earth; falls to pieces when put into water with a hissing noise. Before the blowpipe, fuses partially and with difficulty into a whitish enamel. The corundum is imbedded both in this earth and that arising from the decomposed talcose schist; the whiter fragments occur sometimes as hexagonal prisms tapering off to the extremity. The locality can be easily distinguished by the external appearance of the crystals, those found embedded with the iron ore having a ferruginous covering, whilst those found in the white talcose earth present a white or greyish appearance. Microscopic particles of corundum occur disseminated in this earth, more numerous in some parts than others, as if converging to certain central foci of molecular aggregation. In fact, the whole of the component parts of the surrounding talcose slate appear to be separating from their combined state, and about to enter into some new form. Disintegration in the interior of certain rocks, whether from heat, cold, moisture, electricity, or other cause, seems to be, in some cases, a preparatory stage in Nature's mystic laboratory to matter assuming new forms; and under certain relative conditions we find the same agents that caused their decomposition, actively operating in their re-aggregation. Heat and

electricity are powerful dispersive and aggregative agents. For familiar illustration, I need scarcely point to the flame produced by the blowpipe reducing at one point a metal to dust, and at another restoring the dust to its metallic state. By the judicious application of heat nearly solid particles can be made to move through and converge in the centre of a nearly solid mass, as exemplified by the experiment of Breislak, who succeeded in forming a nucleus of a variegated copper in the centre of a mass of pure copper pyrites, by subjecting it to a heat below that of fusion. Decomposition, however, is not an absolutely necessary condition for the production of adamantine spar, as I have seen it in canular nests in gneiss but little disintegrated.

The talc schist is sometimes hardened and consolidated by contact with the iron ore, as seen in blocks thrown out of a mine near the foot of the ascent. Both the chert and a dark red ferruginous jasper are used by the natives as flints. Salt springs occur in the vicinity. The wells about Gram were, I am told, both sweet and brackish within a short distance; and I picked up a fragment of rock-salt in the green earth of the mine. This is to be accounted for by the nearly vertical position of the strata between which they find their way towards the surface. A little to the east of Kulkairi I crossed a low plain nearly covered with a white travertine, partly compact, partly cellular, resembling that found in the bed of the Cavery at Seringapatam.

Mines of Kulkairi.—The corundum mines at Kulkairi are situated both near the summit, and at the foot of the rising ground there. They are a series of excavations, varying from two to twelve feet in depth, sunk perpendicularly through similar strata to those just described. The corundum is thrown out, cleared, and separated by the miners into four classes, viz., the red, the white, the scraps of both, and the refuse. The three first form the article of commerce, which is carried to Mangalore and Tellicherry; and, according to my native informants, there sold by the contractor to the Bombay and Arab merchants, at prices from twelve and fifteen to thirty rupees the candy, according to its quality. A very large quantity (2000 bags) is now (January, 1837,) lying at Tellicherry unsold, owing to a disagreement about the price between the contractor and the merchant. The present contractor for corundum in Mysore is a Lingayet, named Bussetti, an inhabitant of Bowenhulli, in the taluk of Arculcode; his contract has almost expired, and, in consequence, no miners are at work. He took the mines for two years, for which he was to pay the sum of 530 Canteray pagodas. The former contractors paid 500 for two, or

250 for one year, consequently it may be supposed that the produce has risen in value. These mines were only opened about seven or eight years ago by a native, named Hari Ram. I need scarcely add, the corundum is used by natives, pounded as emery, to polish precious and other stones, particularly granite and basalt. It is also mixed for this, and other purposes, with melted lac, in fine and coarse powders, as we use a mixture of glue and sand. It is said to be found at Mundium in Mysore, at Gudjelhutty in Coimbatore, at the Topoor Ghat in Salem, at Chennimully in Coimbatore, and in Cuttack.

At Namaul and at Viralinodos, on the north bank of the Cauvery, in the Permutty taluk, Salem district, it occurs embedded in gneiss, and a greyish earth, resulting in part from the disintegration of that rock. It is found in this vicinity in great abundance, in a low hill near the village of Sholasigámany, Trichingode taluk; Caránel, Anpore, Mallapollaye, and at various localities up the river Cavery, as far as Cocarambadi, where it is dug for by the natives in the fields; and there are the remains of many ancient excavations still to be traced.

The corundum was formerly sent as an article of traffic to Palghatsherry, and thence to the western coast, and various other parts of India. It can still be procured at the rate of from fifteen to thirty measures the rupee, each measure weighing fifty-seven ounces, avoirdupois. The caste usually employed in collecting it is the Vittaver.

Ruby Localities.—Fine rubies have, from time to time, been discovered in many of the corundum localities just enumerated, associated with this gem, particularly in the gneiss at Viralinodos and Sholasigámany. The natives inform me that it occurs also in the Trichingode taluk and at Mallapollaye, but it is rare, comparatively speaking.

Garnet.—This gem, the red variety, is very generally diffused over India. Its geognostic position, the hypogene or metamorphic schists, more particularly near their line of junction with the plutonic rocks, or trap dykes; for instance, in the crystalline and metalliferous areas of Salem and Nellore, already described, whence the finest crystals are procured, and sold by the native merchants at an insignificant price. Colophonite is not uncommon in these tracts, as also in Mysore, the Nilgherries, the Carnatic, and other provinces of Southern India. It usually occurs in the granite, associated with the hypogene schists. That beautiful variety of dodecahedral garnet, called cinnamon-stone or essonite, has been

discovered in the Nilgherris, in the hypogene hornblende rock, near the Seven Cairns Hill, by Dr. Benza, where their number is such, he informs us, that entire portions of the rock are formed almost exclusively of them. The essonite and hornblende are in large separate crystals, imbedded in a paste of compact felspar and hornblende; the former is very liable to disintegrate, leaving, in falling out, small cavities in the rock.

Green garnet is of rare occurrence: the only locality where I discovered this gem was in the Salem district at Sankerydroog, lat. $11^{\circ} 29' N.$, long. $77^{\circ} 58' E.$, associated with other green crystals in quartz veins, penetrating hornblende schist. The latter is associated with gneiss, garnet rock, actinolitic schist, and altered limestone, thrown into disorder by the intrusion of a porphyritic granite. The green garnet is not found in considerable quantities.

A mine of precious garnet occurs at Gharilpit, about eight miles south of Palunshah, in the Hyderabad country, in the detritus of a granitic rock, penetrated by trap dykes, and composed of mica, garnets, kyanite, quartz, and felspar. Dr. Voysey, who gives a description of this mine¹, states that the precious garnets are found at the depth of eight or ten feet in the alluvium at the foot of the rock. The surface of the rock and soil were strewn with garnets in great profusion, but these were generally of a very coarse kind. The garnets when collected are gently pounded, and the bad ones broken: those which survive the blows are reckoned of good quality.

¹ Asiatic Journal of Bengal, vol. ii., p. 404.